



PIER Energy System Integration Program Area

Electric System Reliability Enhancements

Contract #: 150-99-003 **Project #:** 1

Contractor: Lawrence Berkeley National Laboratory

Subcontractors: Electric Power Research Institute, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Sandia National Laboratories, Bonneville Power Administration, Southern California Edison, University of Wisconsin, Electric Power Group, Optimal Technologies

Project Amount: \$7,200,000

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Commission Contract Manager: Don Kondoleon (916) 654-3918

Status: Completed

Project Description:

The purpose of this project is to address the transition of California's electricity supply and delivery infrastructures from vertically integrated, utility-controlled organizations to restructured, market-driven institutions. Power supply, network management and control systems are being driven to find new solutions to the traditional methods used to ensure stable power flows, frequency and voltage control. This project will provide an integrated suite of reliability-related research and technology development that will help produce quicker and more flexible options for meeting the reliability needs of California's electricity consumers in the new industry structure. This project was conducted by Lawrence Berkeley National Laboratory, acting on behalf of the Consortium for Electric Reliability Technology Solutions (CERTS).

This project supported the PIER Program objectives of:

- Improving the reliability/quality of California's electricity infrastructure by finding new solutions to ensure and maintain reliable electric service in California's restructured electricity market.
- Improving the energy cost/value of California's electricity by increasing the efficiency and competitiveness of California's restructured electricity market.

Proposed Outcomes:

1. Identify and define priorities for publicly-funded reliability research needed to ensure and maintain reliability in California's restructured electricity industry.
2. Conduct research in the area of real time system management that will allow California's interconnected power system to operate with a better understanding of actual, ever-changing in real time, reliability limits.
3. Conduct research in the area of integration of distributed resources needed to capture the full potential of distributed resources to maintain or improve the reliability of the California interconnected power system.
4. Conduct research in the area of reliability and markets, and especially demand response, needed to ensure that a fair and transparent market for reliability services will efficiently and reliably serve California energy consumers.

Actual Outcomes:

1. Prepared technical scoping memos and reports, held workshops, and met with stakeholders and Energy Commission staff to support PIER planning for the ESI transmission reliability program.
2. Modified, fabricated, installed, demonstrated, and provided training for advanced prototype tools for real time system operations in close coordination with and through in-kind support from the California Independent System Operator (ISO). The tools included: VAR Management, Synchronized Phasor Measurement Post-Disturbance Workstation, Advanced Topology Estimator, Short-Term Load Forecaster, Operator Training Simulator, Dynamic Transformer Rating, and Short-Term Market Simulator.
3. Refined concepts, conducted laboratory bench testing, and prepared initial technical specifications for a full-scale demonstration of the CERTS Microgrid, which allows for clusters of distributed energy resources (DER) to operate as an integrated unit, both connected to and isolated from the electricity grid, with a minimum of fast communication between individual generating units. Implemented enhancements to a DER customer adoption modeling tool. Developed a proof-of-concept for an advanced power electronic inverter.
4. Provided technical support for the re-design of California ISO's congestion management system; conducted scoping for a first-ever demonstration of the use loads to provide system spinning reserve; and supported PIER planning for ESI Demand Response program.

Project Status:

The initial tasks under the original contract for this project, as outlined above, have all been completed. Additional tasks, funded through follow-on amendments to the original contract, are still in progress. Preparation of the final report for this project is pending completion of the overall contract. Technical appendices describing work completed under each task have been prepared. The results of the project are being used (or are expected to be used) by the California ISO, and Energy Commission PIER.